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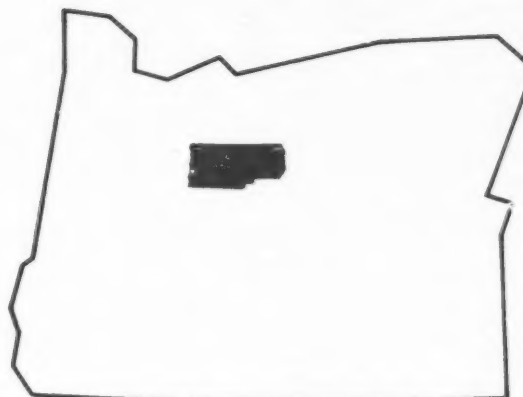
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# FLOOD INSURANCE STUDY



ORIGINAL

CITY OF  
CULVER,  
OREGON  
JEFFERSON COUNTY



SEPTEMBER 4, 1987



Federal Emergency Management Agency

COMMUNITY NUMBER - 410290

BEST COPY AVAILABLE

**NOTICE TO  
FLOOD INSURANCE STUDY USERS**

Communities participating in the National Flood Insurance Program have established repositories of flood hazard data for flood plain management and flood insurance purposes. This Flood Insurance Study may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

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## FLOOD INSURANCE STUDY

### 1.0 INTRODUCTION

#### 1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the City of Culver, Jefferson County, Oregon, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood risk data for various areas of the community that will be used to establish actuarial flood insurance rates and assist the community in its efforts to promote sound flood plain management. Minimum flood plain management requirements for participation in the National Flood Insurance Program (NFIP) are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

In some states or communities, flood plain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the State (or other jurisdictional agency) will be able to explain them.

#### 1.2 Authority and Acknowledgments

The sources of authority for this Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study were performed by U.S. Army Corps of Engineers (COE), for the Federal Emergency Management Agency (FEMA), under Inter-Agency Agreement No. IAA-EMW-E-1153, Project Order No. 1, Amendment No. 29. This study was completed in May 1985.

#### 1.3 Coordination

An initial coordination meeting was held on July 12, 1983, at the City Hall in the City of Culver. The meeting was attended by city officials and by representatives from the COE and FEMA. The purpose of the meeting was: (1) to inform the city on its status in the NFIP; (2) to gather all available pertinent data on flooding in the community; and (3) to reach an agreement on the areas to be studied. Also discussed were flood hazards and possible location of high-water marks.

An intermediate coordination meeting was held, at which time the work maps, showing flooded areas, were presented by the COE for review by the community officials. The FEMA representative discussed the status of Culver during conversion from the emergency phase to the regular phase of the NFIP.

On September 29, 1986, the results of the study were discussed at the final community coordination meeting, which was attended by representatives of FEMA, the study contractor, and the community. All significant problems raised at that meeting have been addressed in this study.

## 2.0 AREA STUDIED

### 2.1 Scope of Study

This Flood Insurance Study covers the incorporated areas of the City of Culver, Jefferson County, Oregon. The area of study is shown on the Vicinity Map (Figure 1).

A small, unnamed, local drainage and several small depressions were studied by detailed methods. These areas studied by detailed methods were selected with priority given to all known flood hazard areas and areas of projected development or proposed construction through May 1990.

### 2.2 Community Description

The City of Culver is located in south-central Jefferson County, in north-central Oregon. The city is 8 miles southwest of Madras, the county seat, and approximately 120 miles southeast of Portland, Oregon.

The area of Culver was first settled by William Barber, who homesteaded the site. The community was established in 1912, when residents from the area now occupied by Haystack Lake relocated along the new railroad line, which had been built through the area in 1911. It was first known as Colver after the first postmaster, Mr. Colver. From 1914 to 1916, the community served as county seat for Jefferson County. Early development centered on dryland farming and retail commerce (Reference 1). The city was incorporated in 1946.

The economic character of Culver has not changed substantially. It remains a community dependent on serving the agricultural activity in the area. However, most employment is found in communities or industry located outside the corporate limits. The employment area includes Madras, Prineville in Crook County, and Redmond in Deschutes County. There is a large agricultural sales and service operation, which markets potatoes, seeds, and fertilizer. The only industrial concern within the corporate limits of Culver is a boat-manufacturing firm, which provides full-time employment to about 70 persons (Reference 1).

The population of Culver expanded over 70 percent from 1960 to 1980 (from 301 to 514). The population was estimated at 510 in 1982 (Reference 2).



FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF CULVER, OR  
(JEFFERSON CO.)

APPROXIMATE SCALE

2000 0 2000 4000 6000 FEET

VICINITY MAP

Culver is located on the central Oregon high plateau at an elevation of approximately 2,600 feet. The climate of Culver is characterized by cold, moderately dry winters and dry, warm summers. No official temperature or precipitation records are kept for Culver; however, the climate is the same as for Madras, where long-term records are available. Average annual precipitation at Madras is 10.1 inches. Approximately 40 percent of the precipitation occurs during the months of November through January. Mean daily temperature in January is 31°F and in July is 66°F (Reference 3). The mean daily minimum and maximum temperatures are 20°F and 40°F, respectively, in January and 44°F and 87°F, respectively, in July (Reference 4).

### 2.3 Principal Flood Problems

When the community was established and streets were laid out, the natural drainage through the area was disrupted. Flooding from the study stream is generally caused either by snowmelt or a combination of snowmelt and rainfall in the winter, the period of greatest storm activity. Cyclonic rainstorms do occur during the spring, summer, and fall, however, and produce enough precipitation to flood the community. Floods rise quickly following a snowmelt, rainstorm, or both, and usually last between 12 and 24 hours.

Floods occur on almost an annual basis on the study stream where it flows through the community. The stream has a flat slope through the study reach and is almost undefined at several places. No hydraulic structure for the stream is located at the Culver Highway and D Street intersection, a major road crossing where the backwater problem in the community is especially severe. In addition, there are many undersized culverts that cause a backwater problem during floodflows. The heavy debris accumulation in the stream magnifies the backwater problem at these culverts. Interviews with city officials indicate that flood depths reach 1 foot, causing significant local flood damage. Figures 2 through 4 show scenes from the February 1979 flood.



Figure 2. February 1979 Flood on D Street



Figure 3. February 1979 Flood Near 4th Avenue and C Street



Figure 4. February 1979 Flooding on Block Bounded by B and C Streets and 4th and 5th Avenues

#### 2.4 Flood Protection Measures

No structural flood protection measures exist or are proposed for Culver. However, nonstructural measures are being used to help prevent future flood damage. A flood hazard zoning ordinance (Reference 5) that follows the Federal guideline for controlling development within the 100-year flood plain is in effect. In addition, building permits are required for construction; those permits are reviewed to ensure that sites are reasonably safe from flooding.

#### 3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude which are expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for flood plain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10, 2, 1, and 0.2 percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long-term average period between floods of a

specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (1 percent chance of annual exceedence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

### 3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for each flooding source studied in detail affecting the community.

There are no stream gage stations on the unnamed stream that flows through Culver. Discharge-frequency relationships were developed in the regional analysis presented in U.S. Geological Survey Open-File Report 82-4078, Magnitude and Frequency of Floods in Eastern Oregon (Reference 6). The discharge-frequency relationships developed by this procedure were checked by direct correlation with nearby gaging stations.

Peak discharge-drainage area relationships for the unnamed stream as it flows through Culver are shown in Table 1.

### 3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals.

Hydraulic analysis was performed using normal-depth computations at three surveyed cross sections. The cross sections for the unnamed study stream came from a COE field survey. The flooded-area outlines were delineated on a nontopographic base sheet, prepared by the Oregon State Highway Division, at a scale of 1:9,600 (Reference 7). The 100-year flooded-area outlines were checked in the field and reflect historical flood information provided by local residents and city officials.

All elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD). Elevation reference marks used in this study are shown on the maps; the descriptions of the marks are presented in Elevation Reference Marks (Exhibit 2).

Table 1. Summary of Discharges

| <u>Flooding Source and Location</u> | <u>Drainage Area<br/>(Square Miles)</u> | <u>Peak Discharges (Cubic Feet per Second)</u> |                 |                 |                 |
|-------------------------------------|-----------------------------------------|------------------------------------------------|-----------------|-----------------|-----------------|
|                                     |                                         | <u>10-Year</u>                                 | <u>50-Year</u>  | <u>100-Year</u> | <u>500-Year</u> |
| Unnamed Stream                      |                                         |                                                |                 |                 |                 |
| At H Street                         | 1.01                                    | -- <sup>1</sup>                                | -- <sup>1</sup> | 77              | -- <sup>1</sup> |
| At Northern Corporate Limits        | 1.40                                    | -- <sup>1</sup>                                | -- <sup>1</sup> | 97              | -- <sup>1</sup> |

<sup>1</sup>Data Not Available

#### 4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS

The NFIP encourages State and local governments to adopt sound flood plain management programs. Therefore, each Flood Insurance Study provides 100-year flood elevations and delineations of the 100- and 500-year flood plain boundaries and 100-year floodway to assist communities in developing flood plain management measures.

##### 4.1 Flood Plain Boundaries

To provide a national standard without regional discrimination, the 1 percent annual chance (100-year) flood has been adopted by FEMA as the base flood for flood plain management purposes. For the stream studied in detail, the 100-year flood plain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using maps at a scale of 1:9,600 (Reference 7). Small areas within the flood plain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

##### 4.2 Floodways

The floodway is the channel of a stream, plus any adjacent flood plain areas, that must be kept free of encroachment so that the 100-year flood can be carried without substantial increases in flood heights.

Floodways are not applicable in areas of shallow flooding; therefore, no floodway was computed for the City of Culver.

#### 5.0 INSURANCE APPLICATION

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. These zones are as follows:

##### Zone A0

Zone A0 is the flood insurance rate zone that corresponds to the areas of 100-year flooding (usually sheet flow on sloping terrain) where average depths are between 1 and 3 feet. Average whole-foot depths derived from the detailed hydraulic analyses are shown within this zone.

##### Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 500-year flood plain, areas within the 500-year flood plain, areas of 100-year flooding where average depths are less

than 1 foot, areas of 100-year flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 100-year flood by levees. No base flood elevations or depths are shown within this zone.

#### 6.0 FLOOD INSURANCE RATE MAP

The Flood Insurance Rate Map is designed for flood insurance and flood plain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 100-year flood plains that were studied by detailed methods, shows selected whole-foot base flood elevations or average depths. Insurance agents use the zones and base flood elevations in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

#### 7.0 OTHER STUDIES

A Flood Insurance Study for the unincorporated areas of Jefferson County is in progress (Reference 8). The results of this study and those of the Jefferson County Flood Insurance Study will be in agreement.

No other studies concerning flood hazards in Culver were found to exist at the time of this study.

#### 8.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting the Natural and Technological Hazards Division, FEMA, Federal Regional Center, 130 228th Street, SW., Bothell, Washington 98021-9796.

#### 9.0 BIBLIOGRAPHY AND REFERENCES

1. Communications from Mr. Ray Derfee, Councilman, City of Culver, April 15, 1985
2. Norma Paulus, Secretary of State, Oregon Blue Book, 1983-84, February 1983
3. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Monthly Normals of Temperature, Precipitation, and Heating and Cooling Degree Days, 1941-70, Oregon, August 1973

4. Pacific Northwest River Basins Commission, Meterology Committee, Climatological Handbook, Columbia Basin States, Temperature, Volume 1, Part A, June 1969
5. City of Culver, Subdivision Plan and Zoning Ordinance, adopted 1978
6. U.S. Department of the Interior, Geological Survey, Open-File Report 82-4078, Magnitue and Frequency of Floods in Eastern Oregon, 1983
7. Oregon State Highway Department, Maps, Culver, Oregon, Scale 1:9,600, April 1983
8. Federal Emergency Management Agency, Flood Insurance Study, Jefferson County, Oregon (Unincorporated Areas), unpublished

## Exhibit 3 - Elevation Reference Marks

| REFERENCE MARK | FIRM PANEL | ELEVATION (FEET NGVD) | DESCRIPTION OF LOCATION                                                                                                                                                                                                   |
|----------------|------------|-----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| RM1            | 0001       | 2,635.451             | An Oregon State Highway Department bronze tablet, stamped "2636A 1927," located in a concrete post in the east fence line of Culver Highway No. 361 (1st Avenue) at the intersection of C Street, at highway mile 104.65. |